Hourly measurements not required for safe and effective glycemic control in the critically ill patient

Hoekstra, Miriam; Vogelzang, Mathijs; Verbitskiy, Evgeny; Nijsten, Maarten W.

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LETTER

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Miriam Hoekstra*[1], Mathijs Vogelzang[2], Evgeny Verbitskiy[3,4] and Maarten W Nijsten[5]

In the recently published work of Juneja and colleagues the authors describe the excellent results of a computerized insulin dosing algorithm (Clarian GlucoStabilizer™) [1]. To prevent hypoglycemia, however, the authors note that frequent (that is, hourly) measurements are required. We believe that, with an adequate algorithm, the required level of glucose control can be reached without hourly glucose measurements.

We implemented the glucose regulation for intensive care patients (GRIP) computer-assisted glucose regulation program, which uses time-variant sampling intervals [2]. In a recent analysis, hypoglycemia rates were comparable with or lower than those described by Juneja and colleagues [3]. Most importantly, these rates were achieved with only 5.6 measurements per patient per day. In all fairness it must be said that GRIP aimed at (and achieved) levels of 4.0 to 7.5 mmol/l, which is not as tight and challenging as the GlucoStabilizer™ target of 4.4 to 6.1 mmol/l. Nevertheless, it is our conviction that an up to fivefold higher glucose sampling rate cannot be justified by current evidence on glucose control.

Finally, we would like to note that two main approaches for designing computer control of glucose levels exist: model predictive control, and proportional-integral derivative [4]. The underlying algorithm of GRIP is not model predictive control, as mistakenly stated in the article by Juneja and colleagues [1], but proportional-integral derivative. In fact, the algorithm of Juneja and colleagues also appears to be proportional-integral derivative.

To achieve effective and safe computerized glucose control, therefore, it is not necessary to perform hourly measurements, provided a realistic target and an adequate algorithm with a time-variant sampling rate are used.

Abbreviations
GRIP = glucose regulation for intensive care patients.

Author details
[1]Department of Anesthesiology and Department of Cardiology, University Medical Center Groningen, University of Groningen, 9700 RB Groningen, the Netherlands
[2]Department of Cardiology, University Medical Center Groningen, University of Groningen, 9700 RB Groningen, the Netherlands
[3]Department of Dynamical Systems and Mathematical Physics, Research Institute for Mathematics and Computing Science, University of Groningen, 9700 AK Groningen, the Netherlands
[4]Department of Information and System Security, Philips Research, 5621 BA Eindhoven, the Netherlands
[5]Department of Critical Care, University Medical Center Groningen, University of Groningen, 9700 RB Groningen, the Netherlands

Competing interests
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References

1. Juneja R, Roudebush CP, Nasraway SA, Golas AA, Jacobi J, Carrol J, Nelson D, Abad VJ, Flanders SJ: **Computerized intensive insulin dosing can mitigate hypoglycemia and achieve tight glycemic control when glucose measurement is performed and on time.** *Crit Care* 2009, **13:**R163.
2. Vogelzang M, Loef BG, Regtien JG, van der Horst IC, van Assen H, Zijlstra F, Nijsten MW: **Computer-assisted glucose control in critically ill patients.** *Intensive Care Med* 2008, **34:**1421-1427.
3. Hoekstra M, Vogelzang M, Horst IC, Zijlstra F, Nijsten MW: **Low incidence of hypoglycaemia with computer-assisted glucose in intensive care patients [abstract].** *Intensive Care Med* 2009, **35(Suppl 1):**S120.
4. Hoekstra M, Vogelzang M, Verbitskiy E, Nijsten MW: **Health technology assessment review: computerized glucose regulation in the intensive care unit – how to create artificial control.** *Crit Care* 2009, **13:**223.

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*Correspondence: m.hoekstra@thorax.umcg.nl
[1]University Medical Center Groningen, Department of Cardiology, Hanzeplein 1, 9700 RB Groningen, the Netherlands
Full list of author information is available at the end of the article